

ANATOMY OF KIDNEYS

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Objectives

✘ **By the end of this course you should be able to discuss :**

✘ **COMPONENTS OF THE URINARY SYSTEM.**

✘ ***KIDNEY:***

✘ **SHAPE & POSITION.**

✘ **SURFACE ANATOMY.**

✘ **EXTERNAL FEATURES.**

✘ **HILUM and its CONTENTS.**

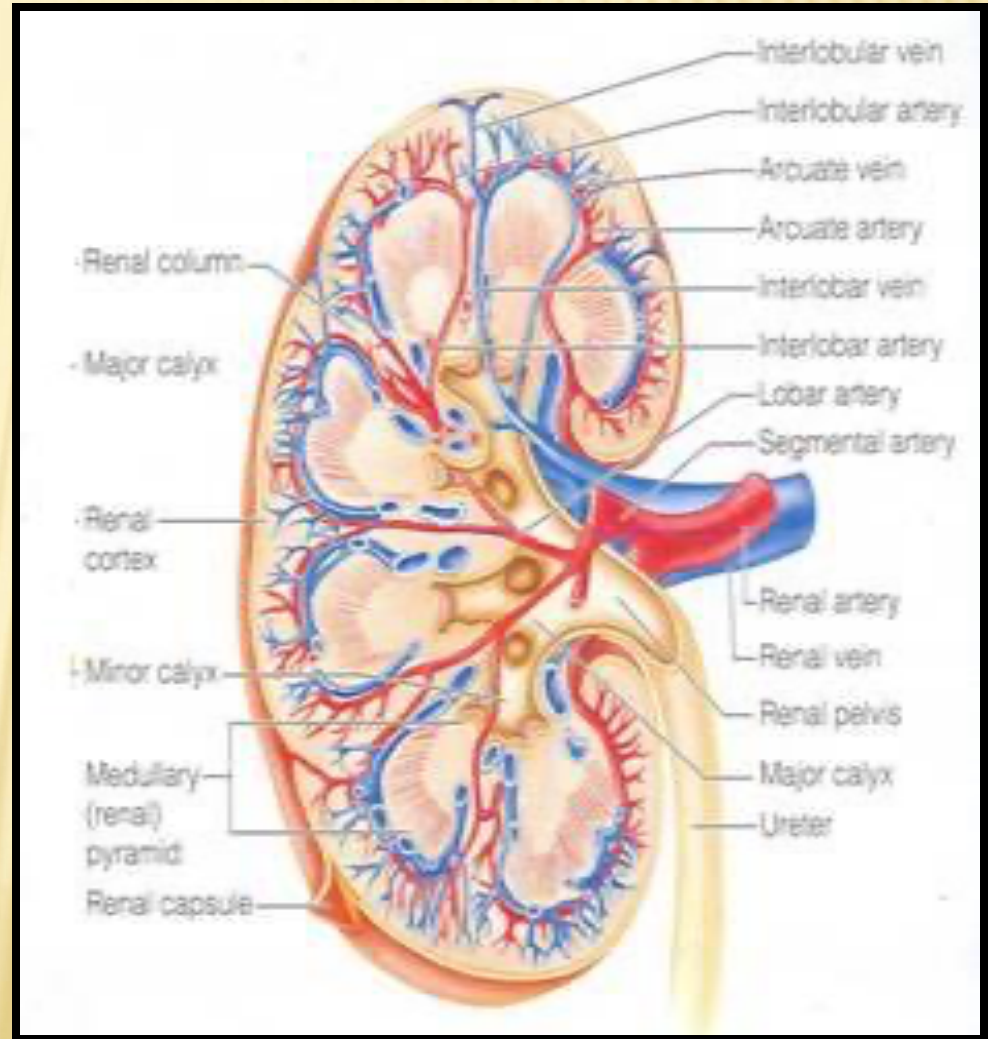
✘ **RELATIONS.**

✘ ***INTERNAL STRUCTURE.***

✘ ***BLOOD SUPPLY***

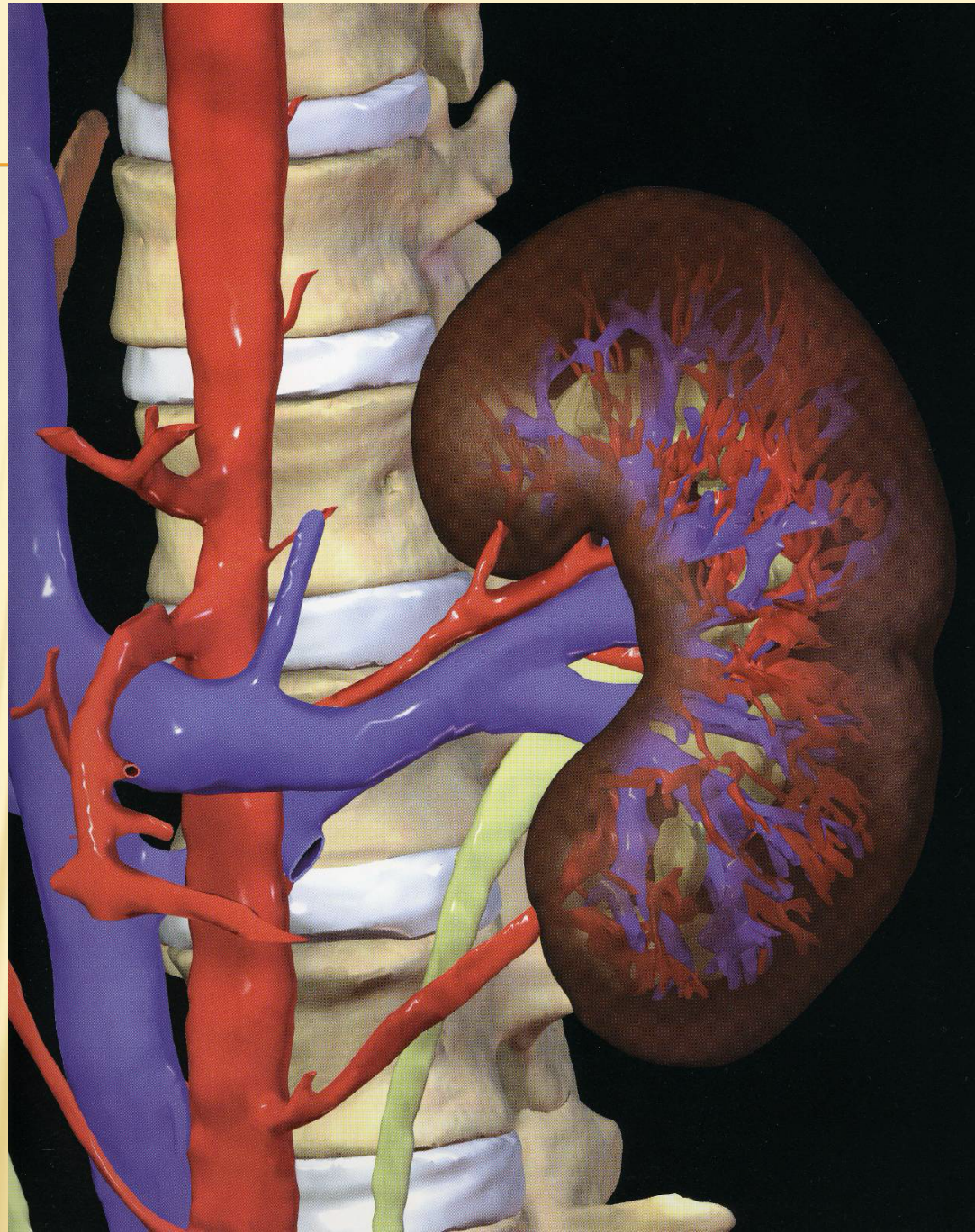
✘ ***LYMPH DRAINAGE..***

✘ ***NERVE SUPPLY.***



INTRODUCTION

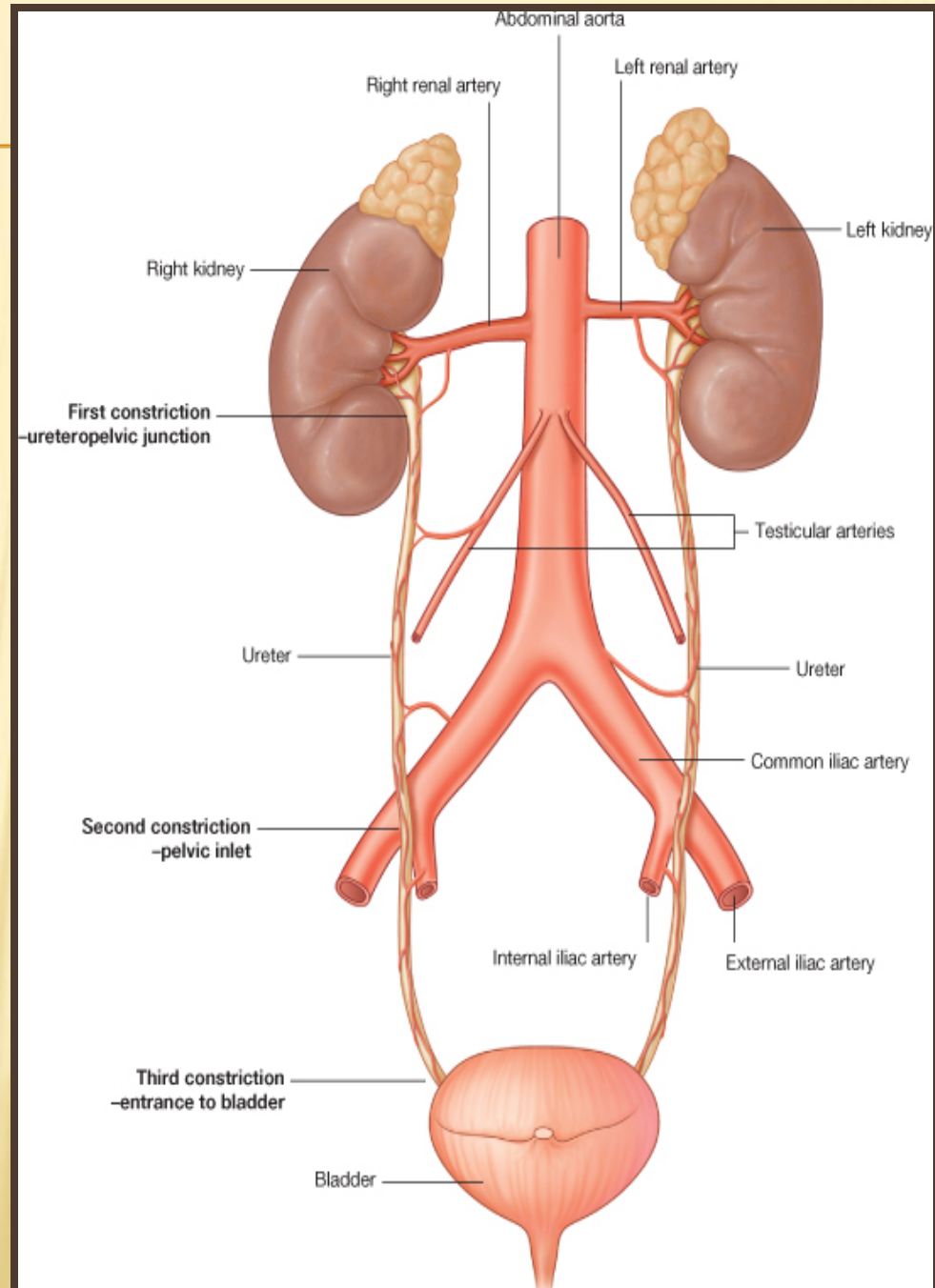
- ✘ Every day, each kidney filters liters of fluid from the **bloodstream**.
- ✘ Although the **lungs** and the **skin** also play roles in excretion, the kidneys bear the major responsibility for eliminating nitrogenous (nitrogen-containing) wastes, toxins, and drugs from the body.



KIDNEY

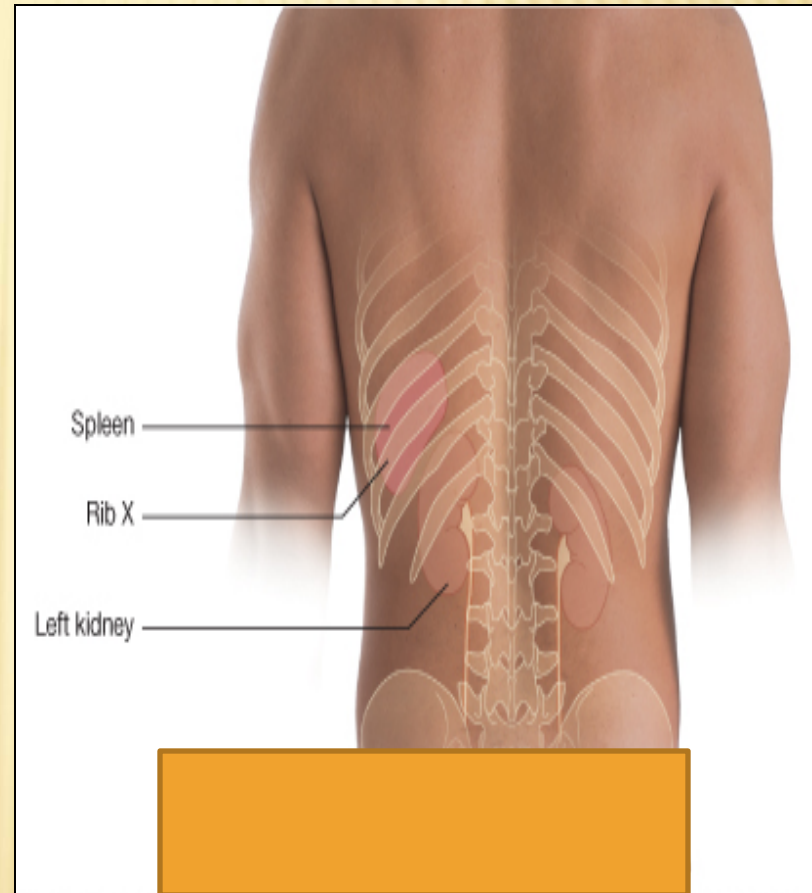
× Functions:

1. **Excretes** most of the waste products of metabolism.
2. **Controls** water & electrolyte balance of the body.
3. **Maintain** acid-base balance of the blood.
4. **Erythropoietin** hormone stimulates bone marrow for RBCs formation.
5. **Rennin** enzyme regulates the blood pressure.
6. **Converts** vitamin D to its active form.



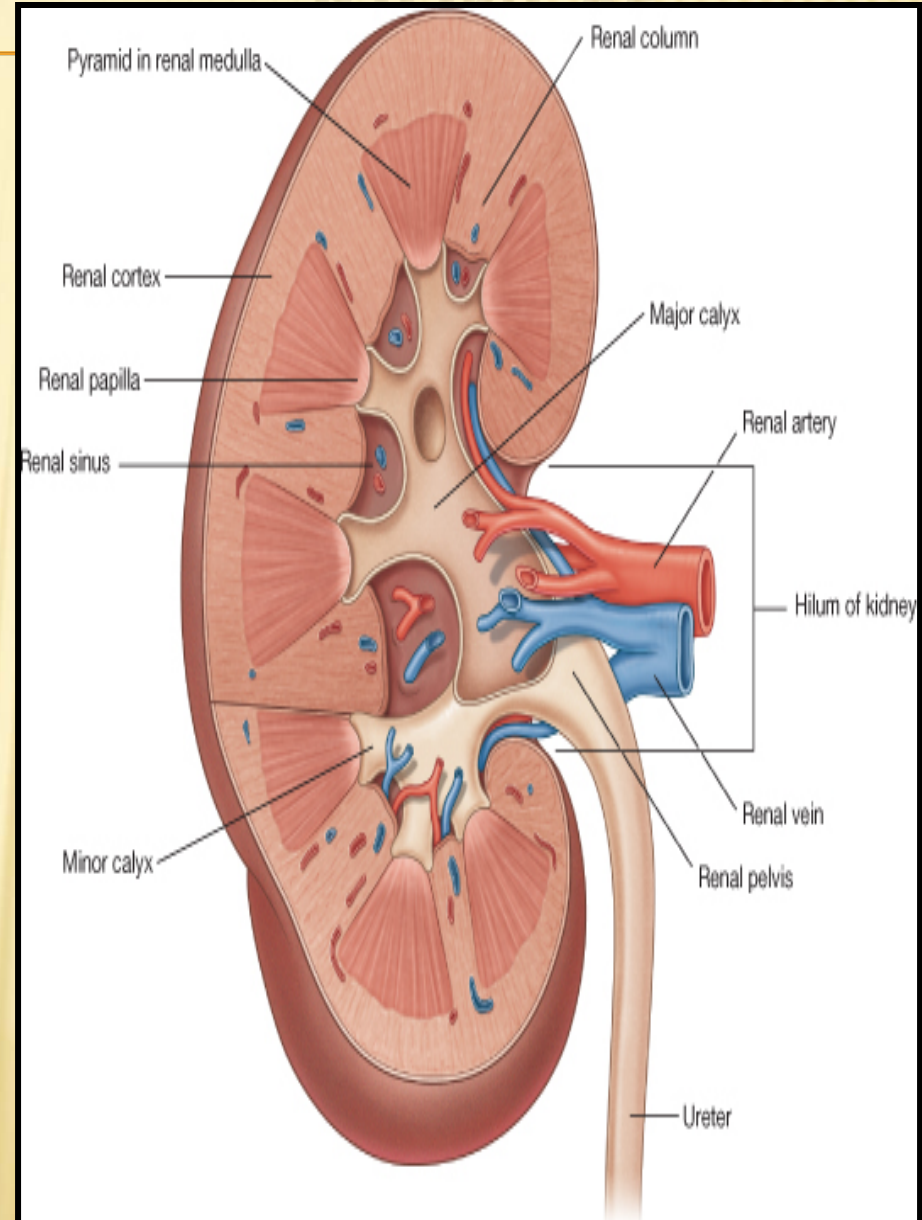
- ✘ Kidneys are reddish brown in color.
- ✘ Lie **behind** the peritoneum on the posterior abdominal wall on either side of the **vertebral column**.
- ✘ They are largely under cover of the costal margin.
- ✘ The right kidney lies slightly lower than the left due to the large size of the right lobe of the liver.
- ✘ The upper border of the right kidney is at the level of **11th intercostal space**.
- ✘ The upper border of the left kidney is at the level of **11th rib**

KIDNEY



KIDNEYS

- ✘ With contraction of the diaphragm the kidney moves downward as much as 2.5 cm.
- ✘ The lateral border is convex, while the medial border is convex at both ends but its middle part shows a vertical slit called the hilum.
- ✘ The hilum extends into a large cavity called the **renal sinus**.
- ✘ The hilum transmits the renal **vein**, two branches of renal **artery**, ureter, and the third branch of renal **artery** from the front backward (V.A.U.A.)



COVERINGS

✘ 1- Fibrous capsule:

It surrounds the kidney.

✘ 2- Perirenal (perinephric) fat :

It covers the fibrous capsule

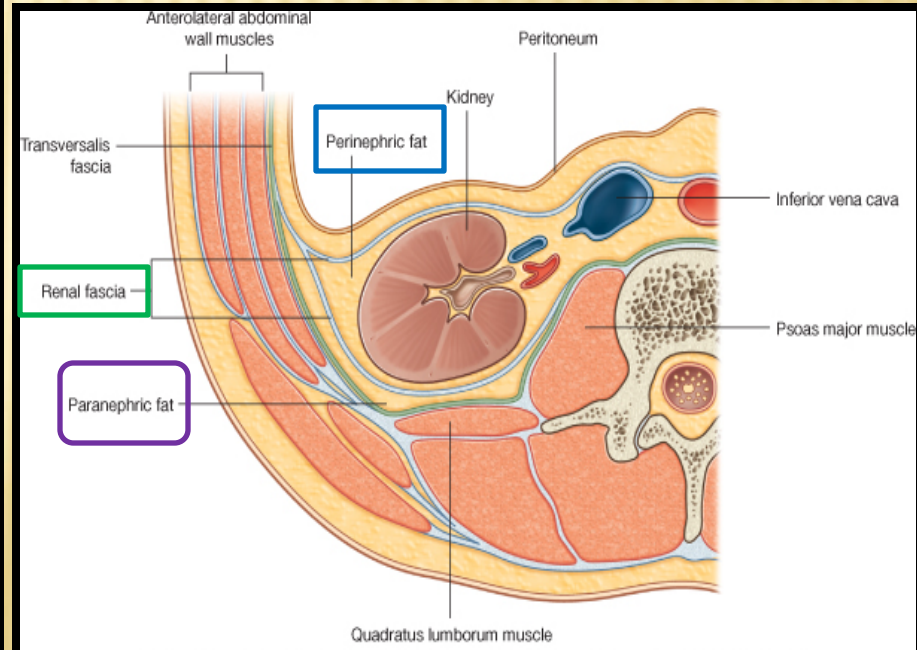
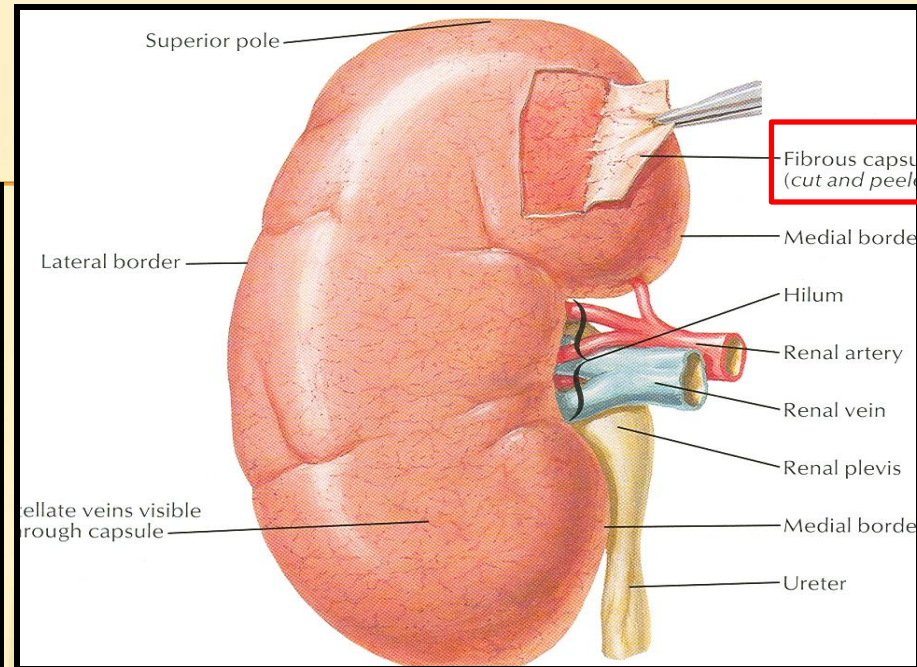
✘ 3- Renal fascia:

It encloses the kidneys and suprarenal glands.

✘ 4- Pararenal (paranephric) fat :

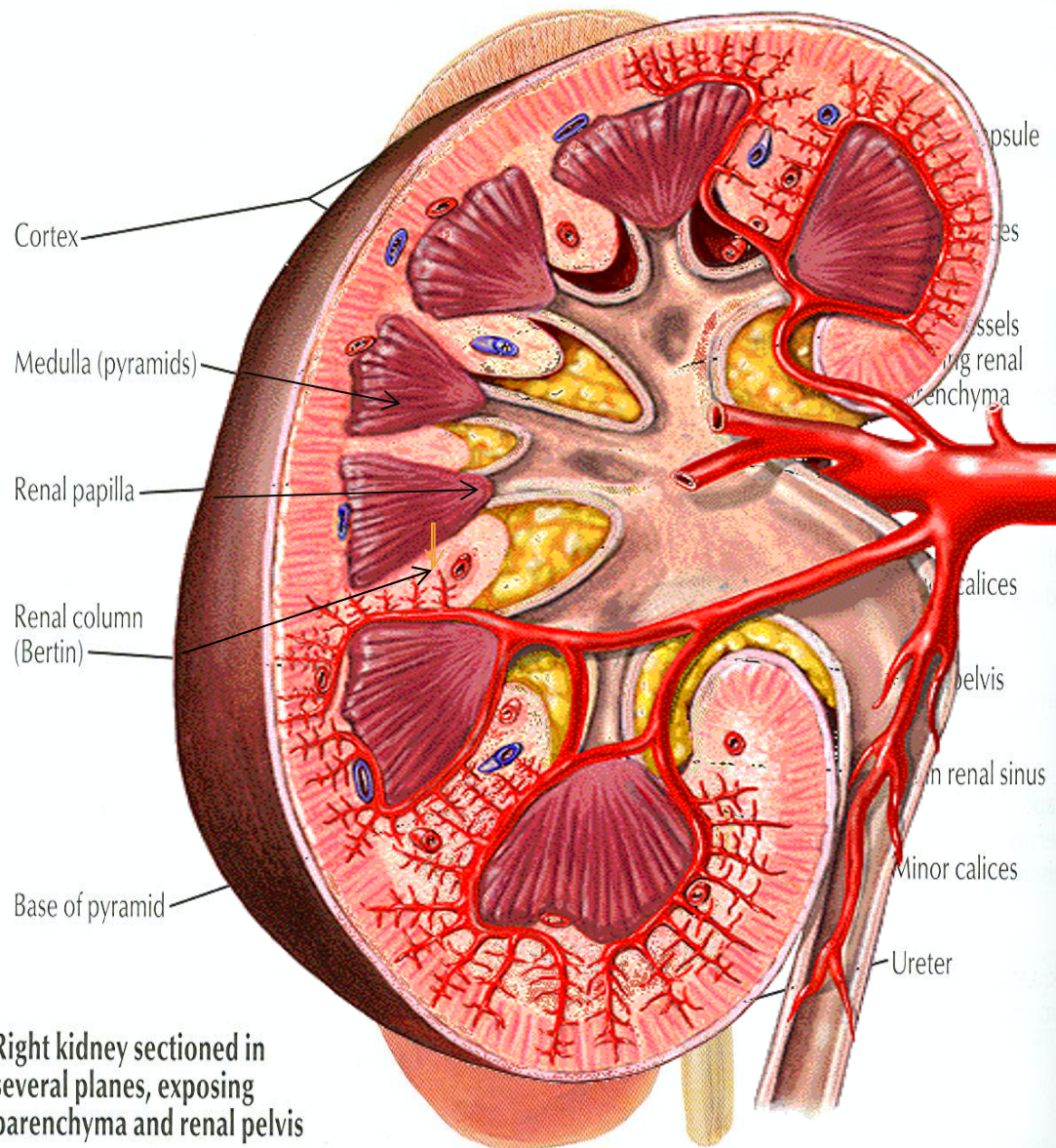
It lies external to the renal fascia, and forms part of the retroperitoneal fat.

N.B. The last 3 structures support the kidney in position.



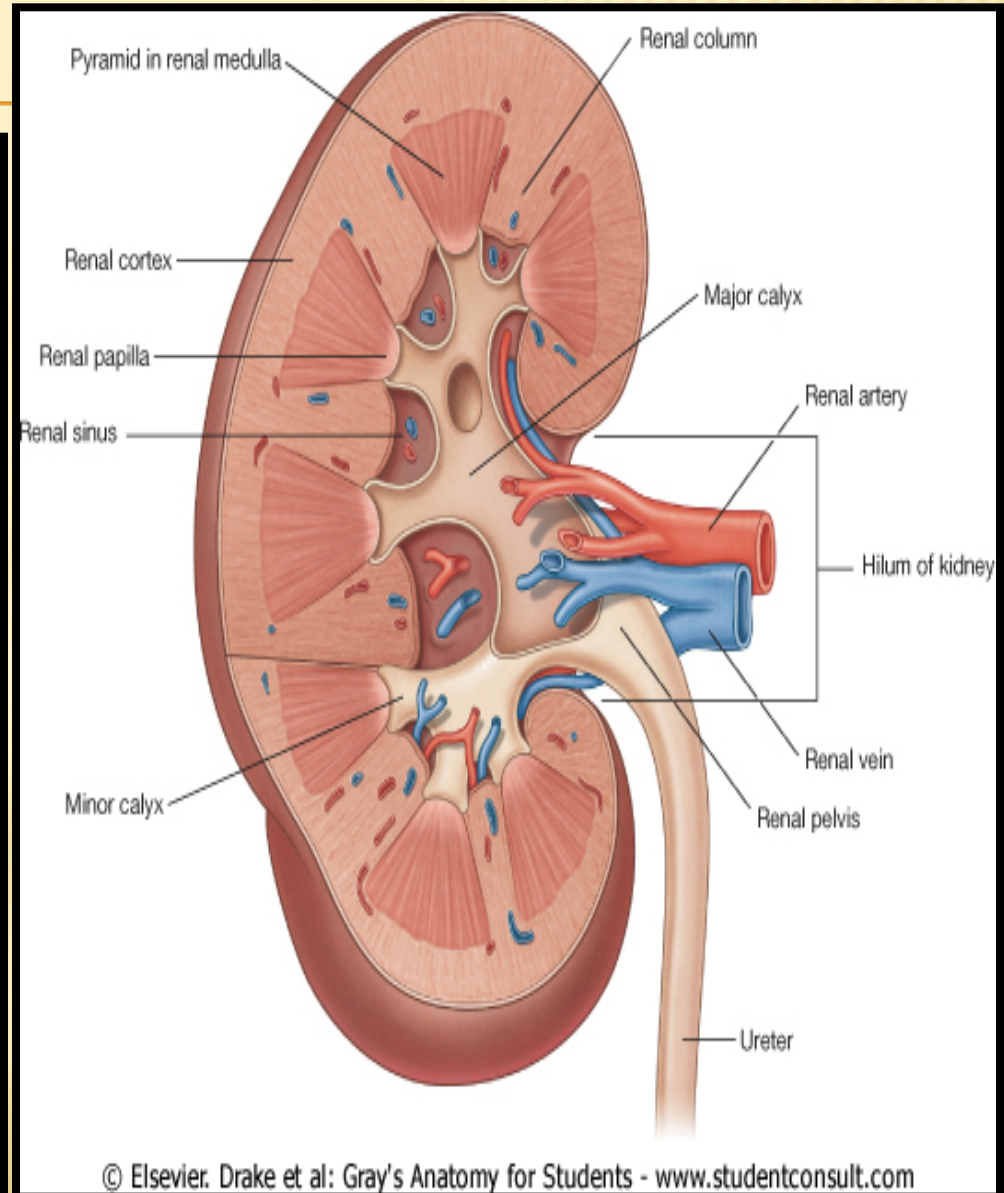
RENAL STRUCTURE

- ✘ Each kidney has an outer **cortex** and an inner **medulla**.
- ✘ Medulla is composed of about **12 renal pyramids**.
- ✘ The base of each pyramid is directed toward the cortex & its apex (the renal papilla) is projecting medially.
- ✘ The cortex extends into the medulla between adjacent pyramids as the **renal column**.



RENAL STRUCTURE

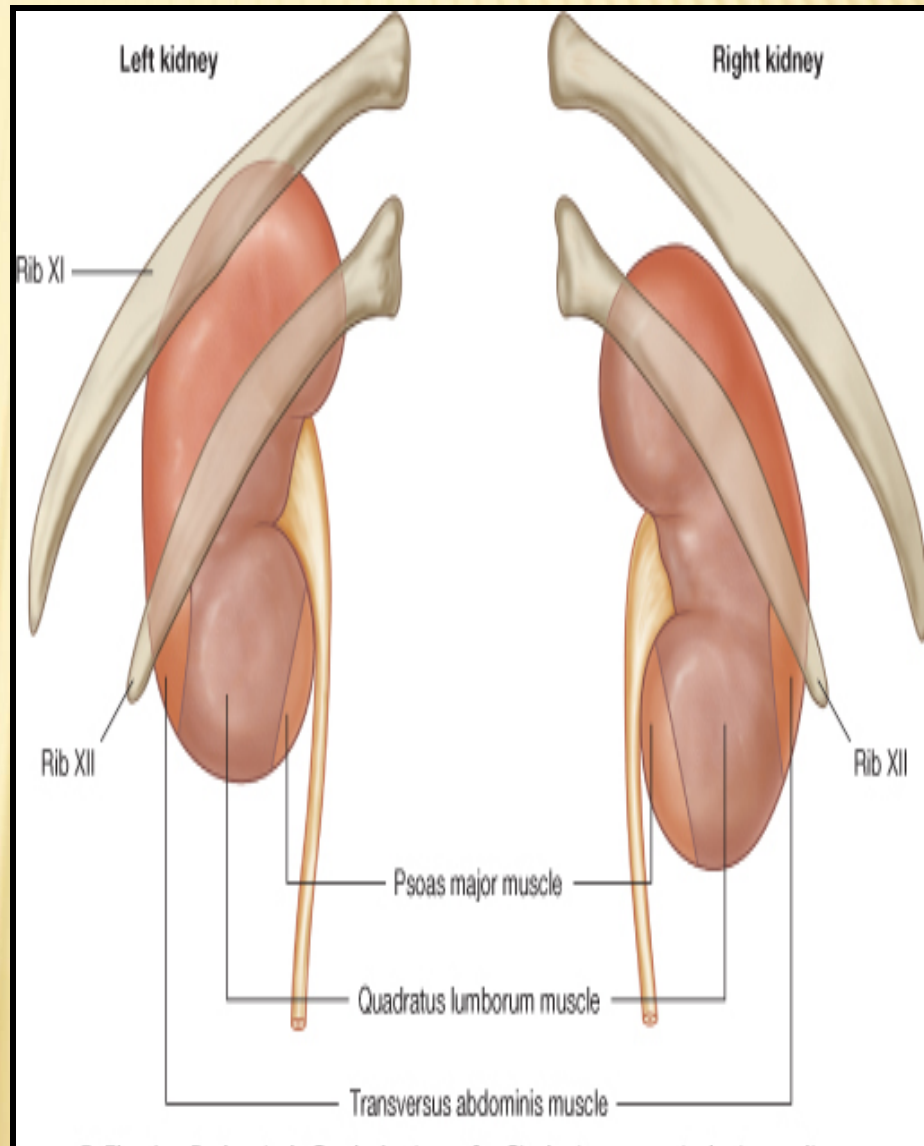
- ✘ Extending from the bases of the renal pyramids into the cortex are striations known as medullary rays.
- ✘ The renal sinus within the hilum, contains the upper expanded end of the ureter, the renal pelvis.
- ✘ Renal pelvis divides into two or three **major calyces**, which divides into two or three **minor calyces**.



POSTERIOR RELATIONS

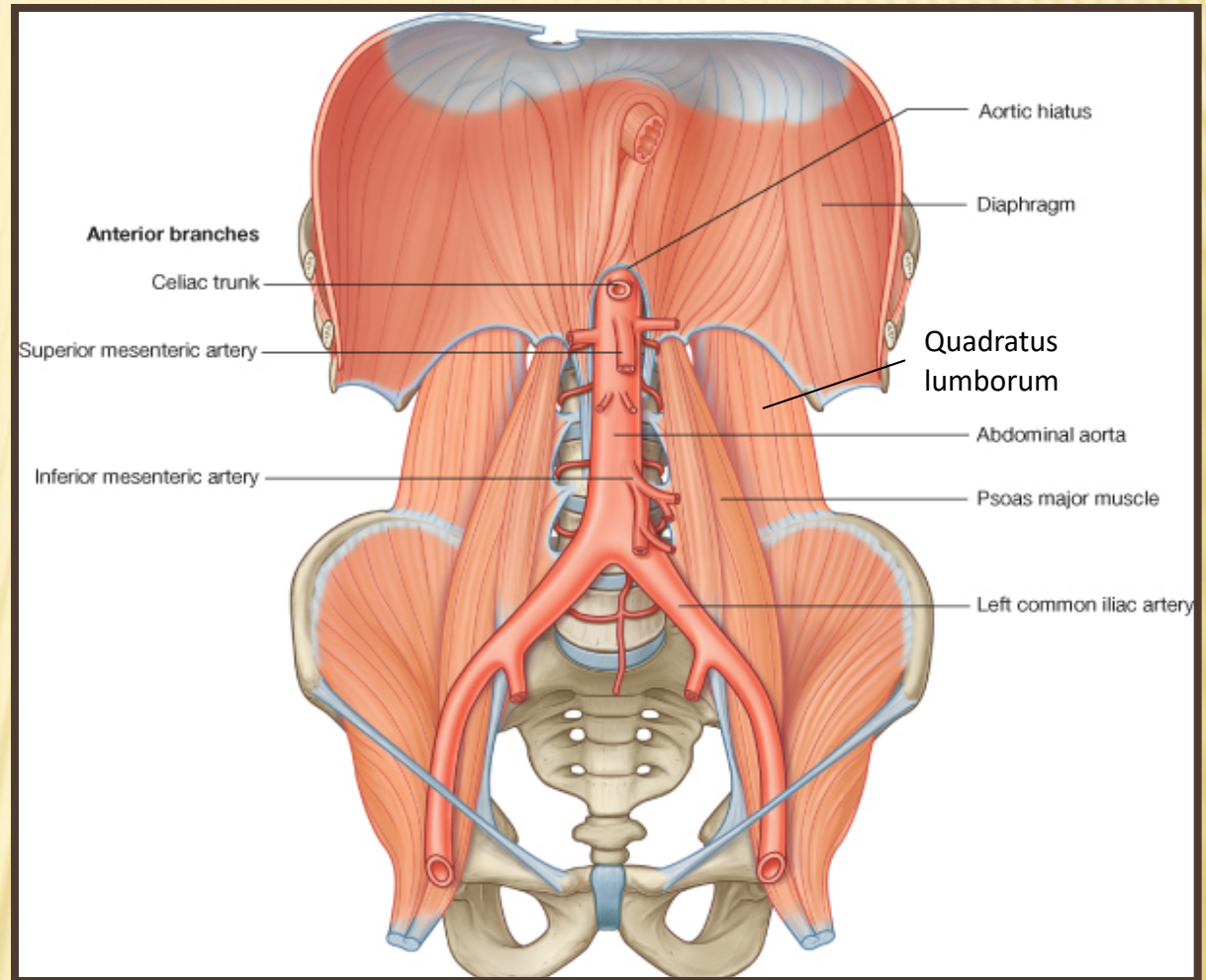
- ✗ Twelfth rib,
- ✗ Costodiaphragmatic pleural recess.

✗

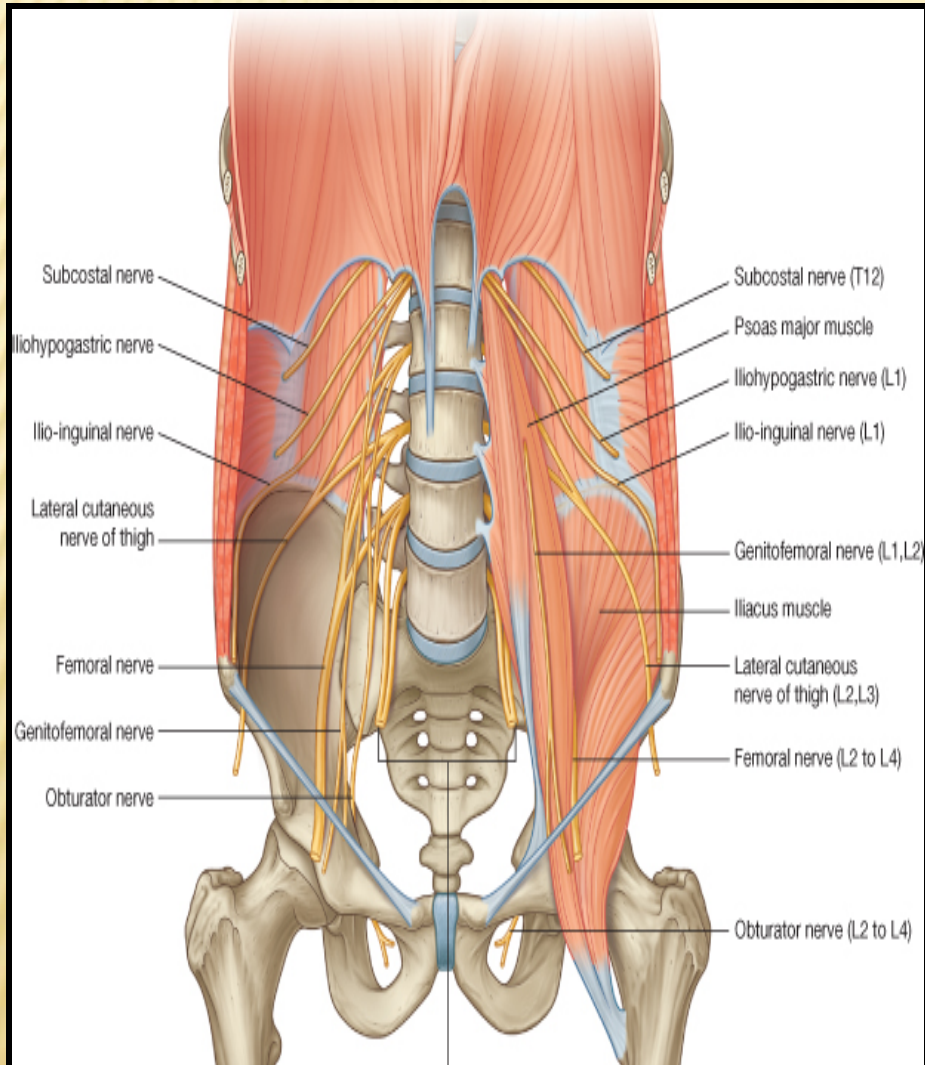


4Muscles:

Diaphragm
Psoas major m.,
Quadratus
lamborum m.,
Transversus
abdominis m.

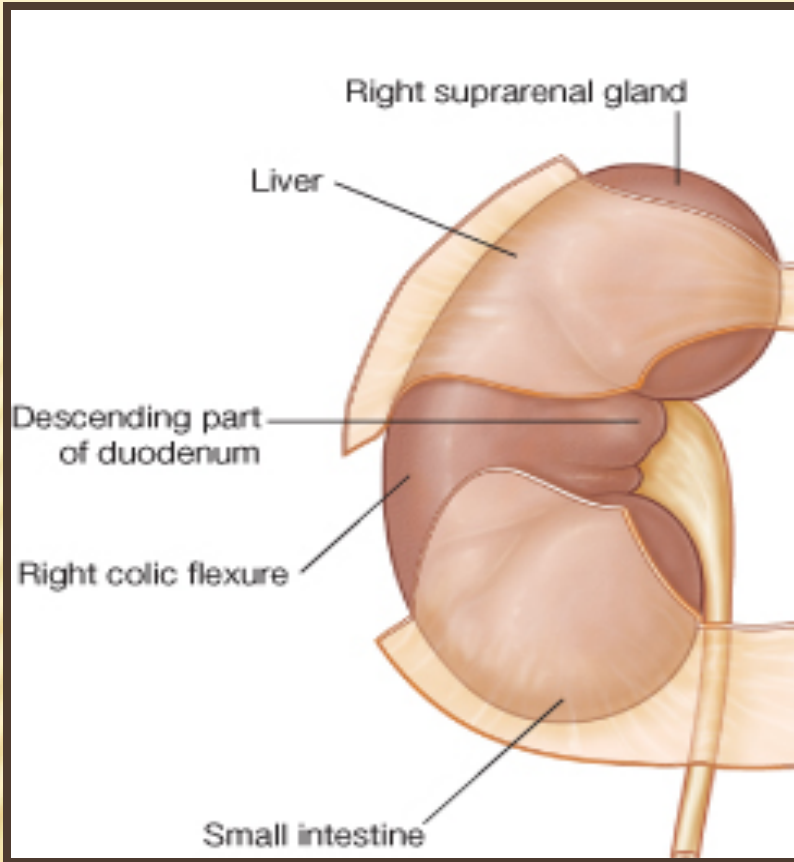


Posterior Relation

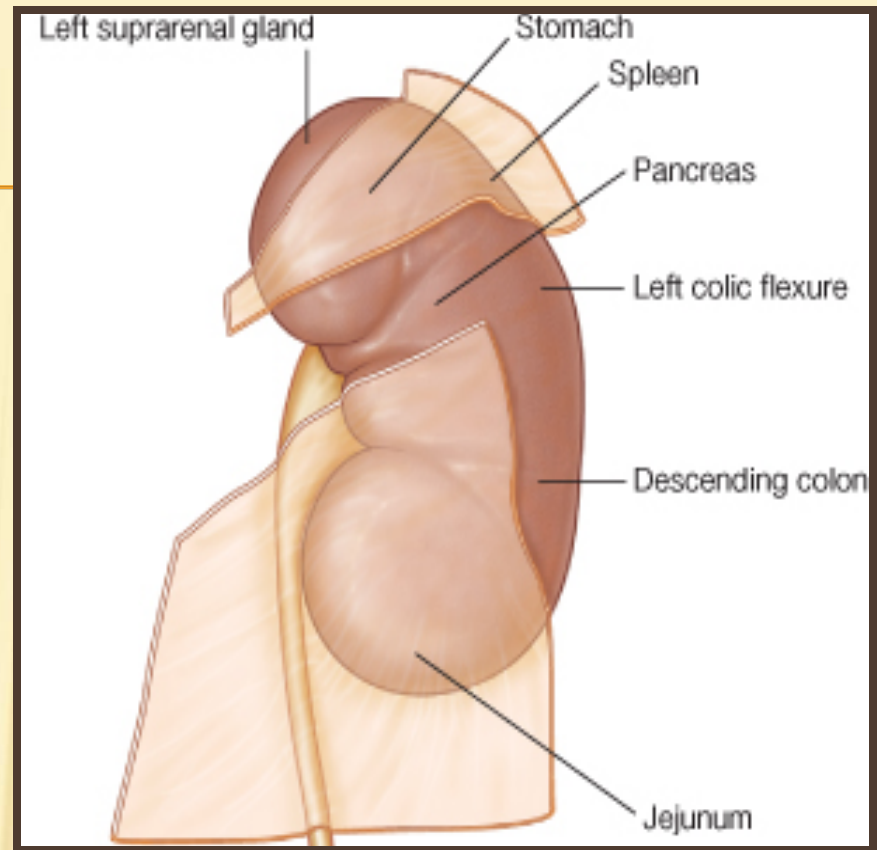


3 Nerves:

Subcostal nerve (T12),
Iliohypogastric (L1)
nerve.
Ilioinguinal (L1) nerve



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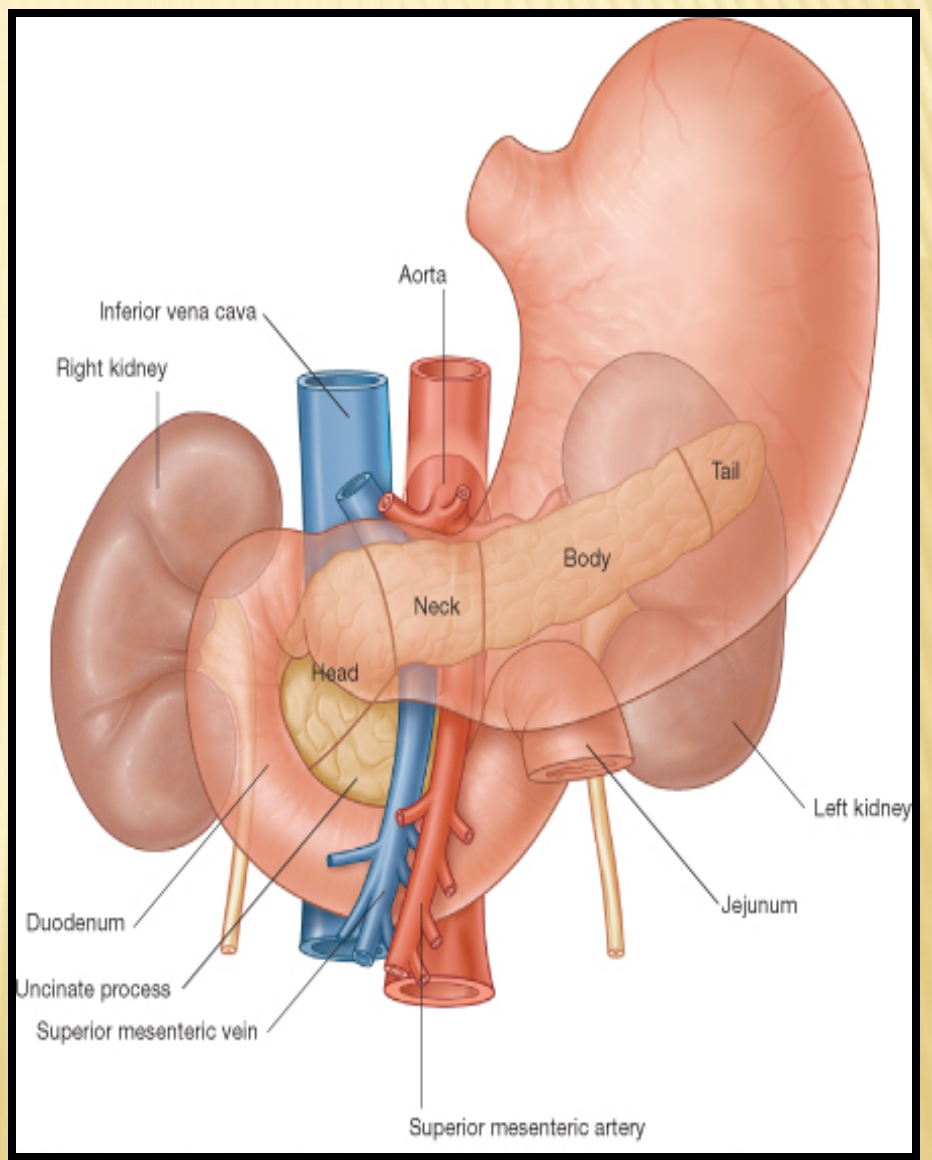
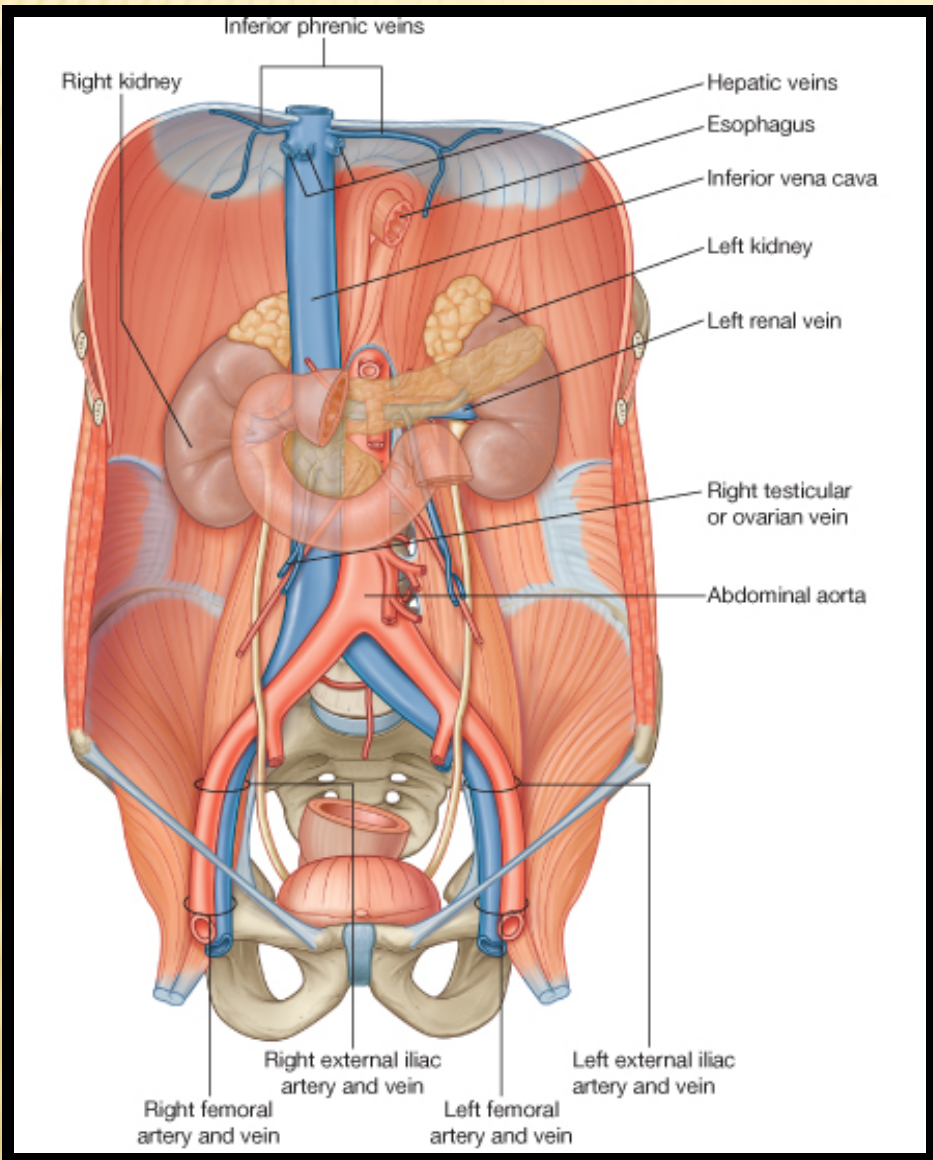


Right Kidney :

- **1-** Right suprarenal gland
- **2-** Liver,
- **3-** Second part of the duodenum
- **4-** Right colic flexure
- **5-** Coils of small intestine

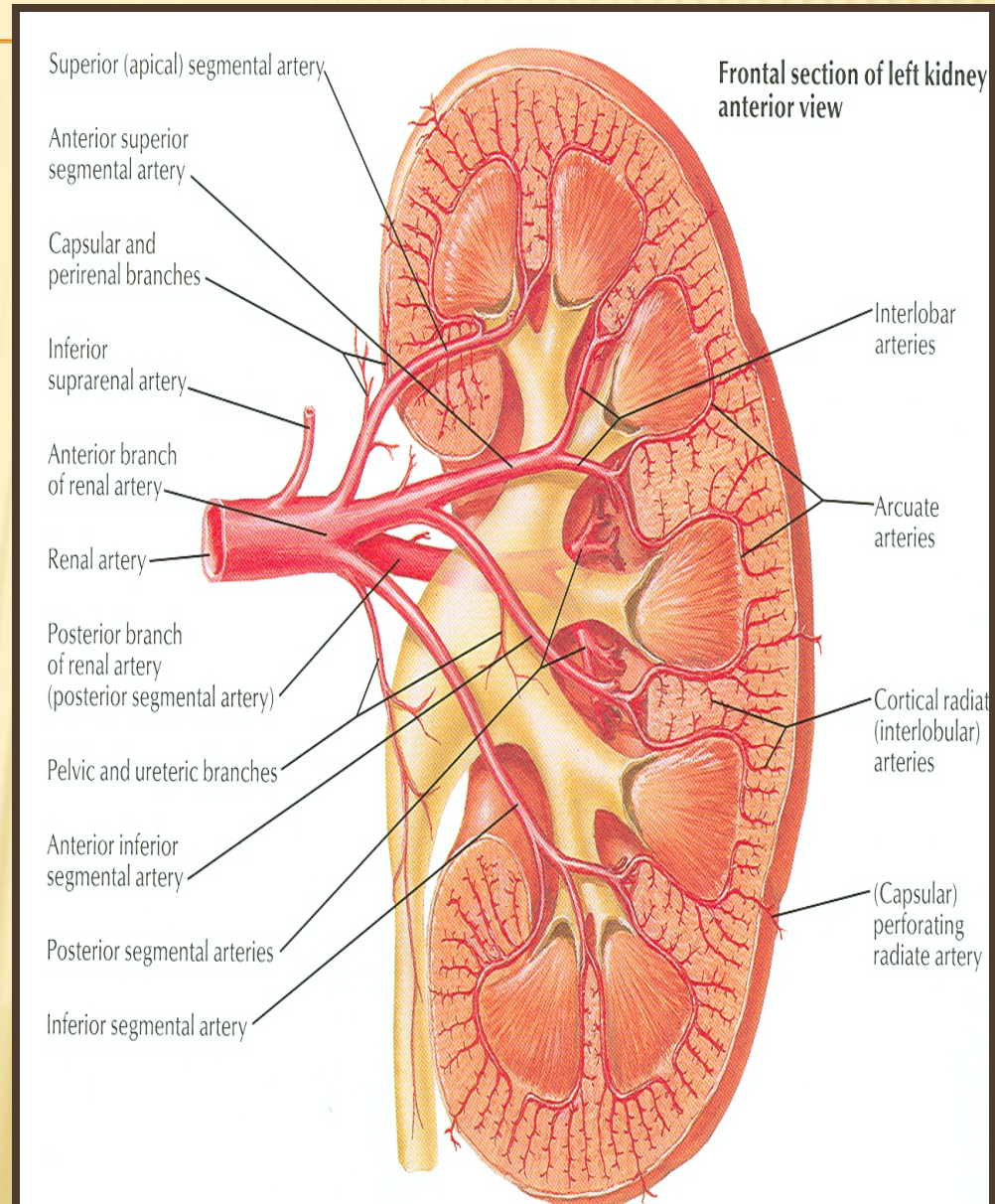
Left Kidney :

- 1-** Left suprarenal gland,
- 2-** Stomach,
- 3-** Spleen,
- 4-** Pancreas,
- 5-** Left colic flexure,
- 6-** Descending colon
- 7-** Coils of jejunum



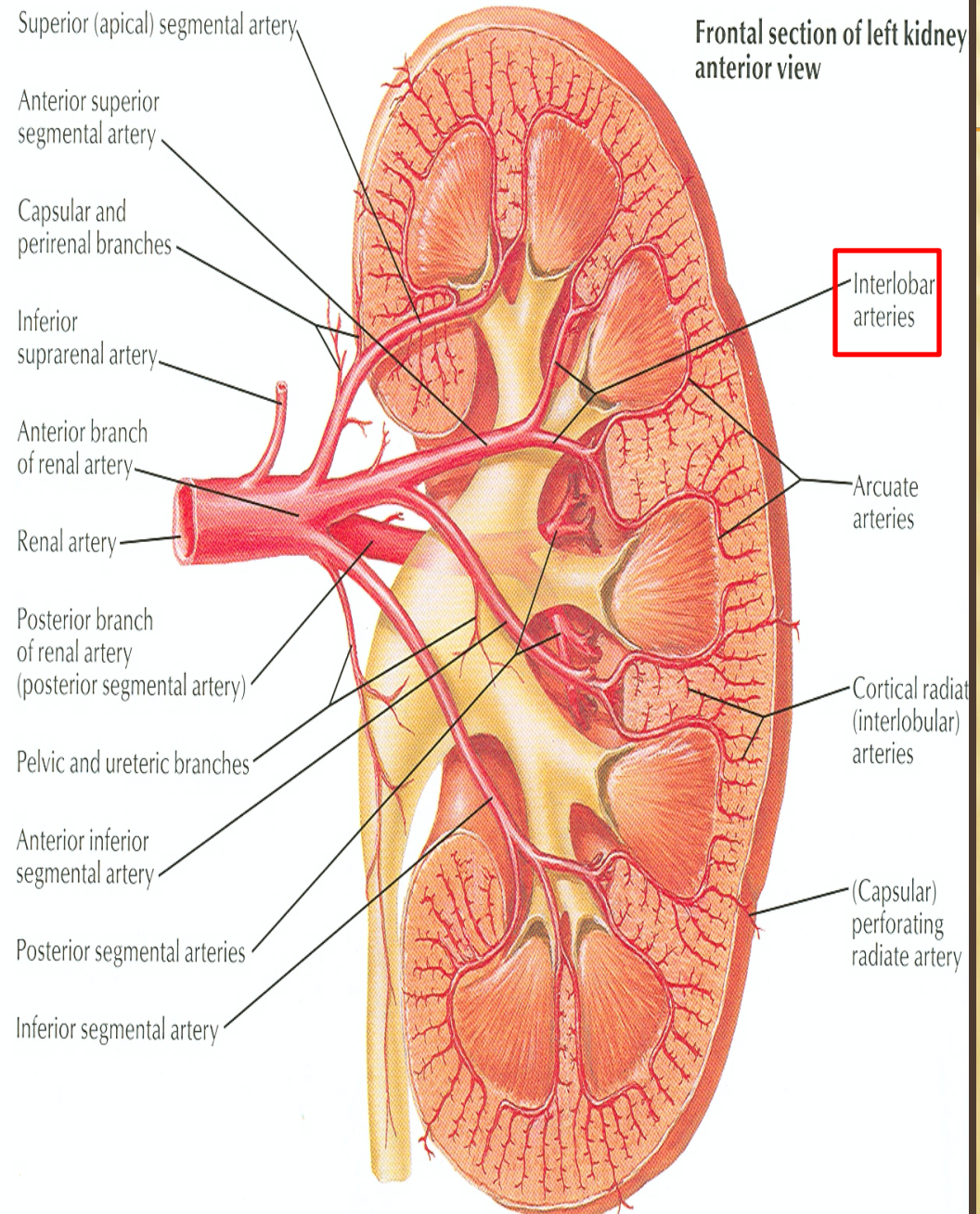
BLOOD SUPPLY

- ✘ The renal artery arises from the aorta at the level of the **second lumbar vertebra**.
- ✘ Each renal artery divides into **five segmental** arteries that enter the hilum of the kidney, four in front and one behind the renal pelvis
- ✘ They are distributed to different segments of the kidney.
- ✘ **Lobar artery** arises from each segmental artery, one for each renal pyramid.

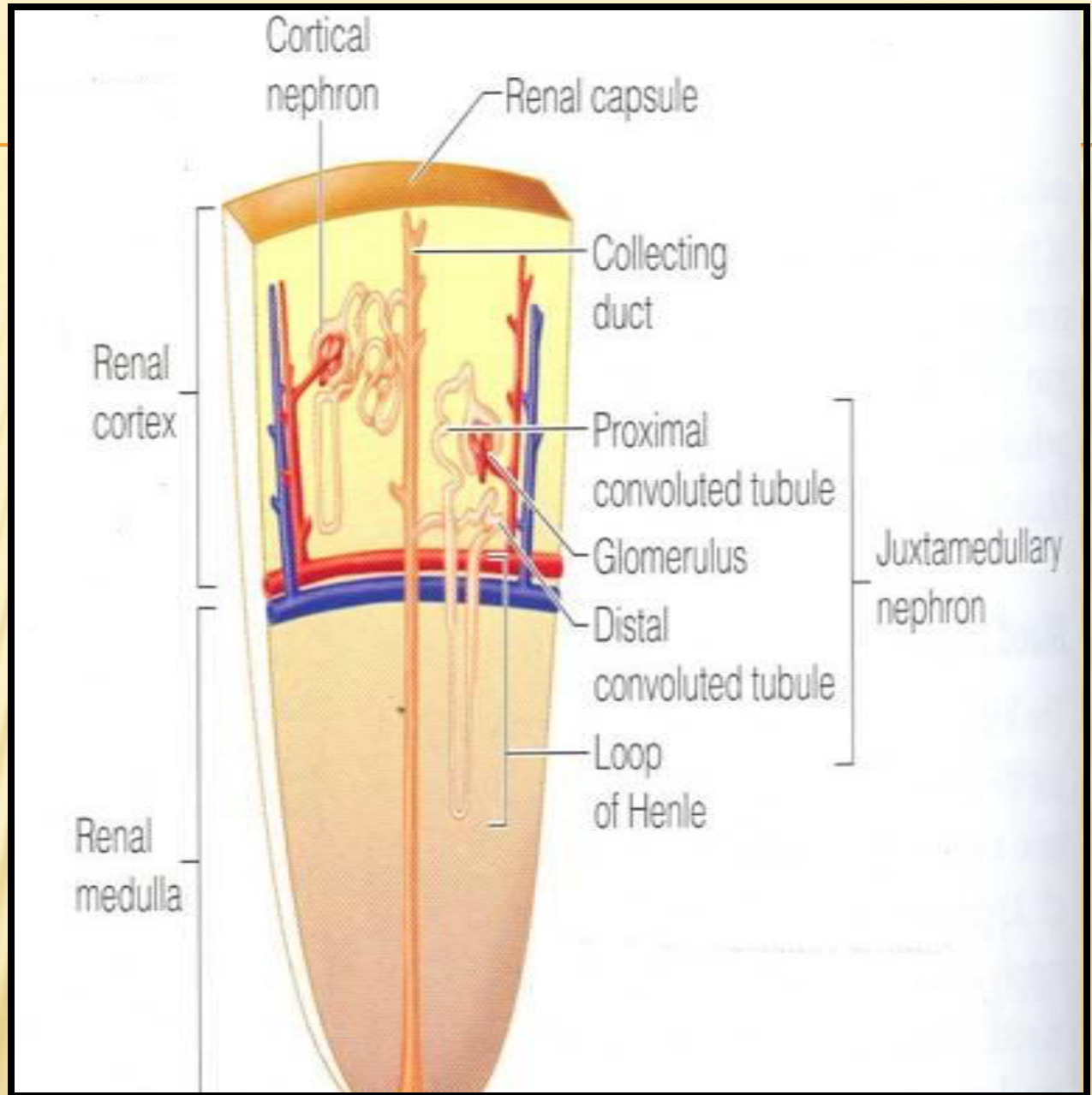


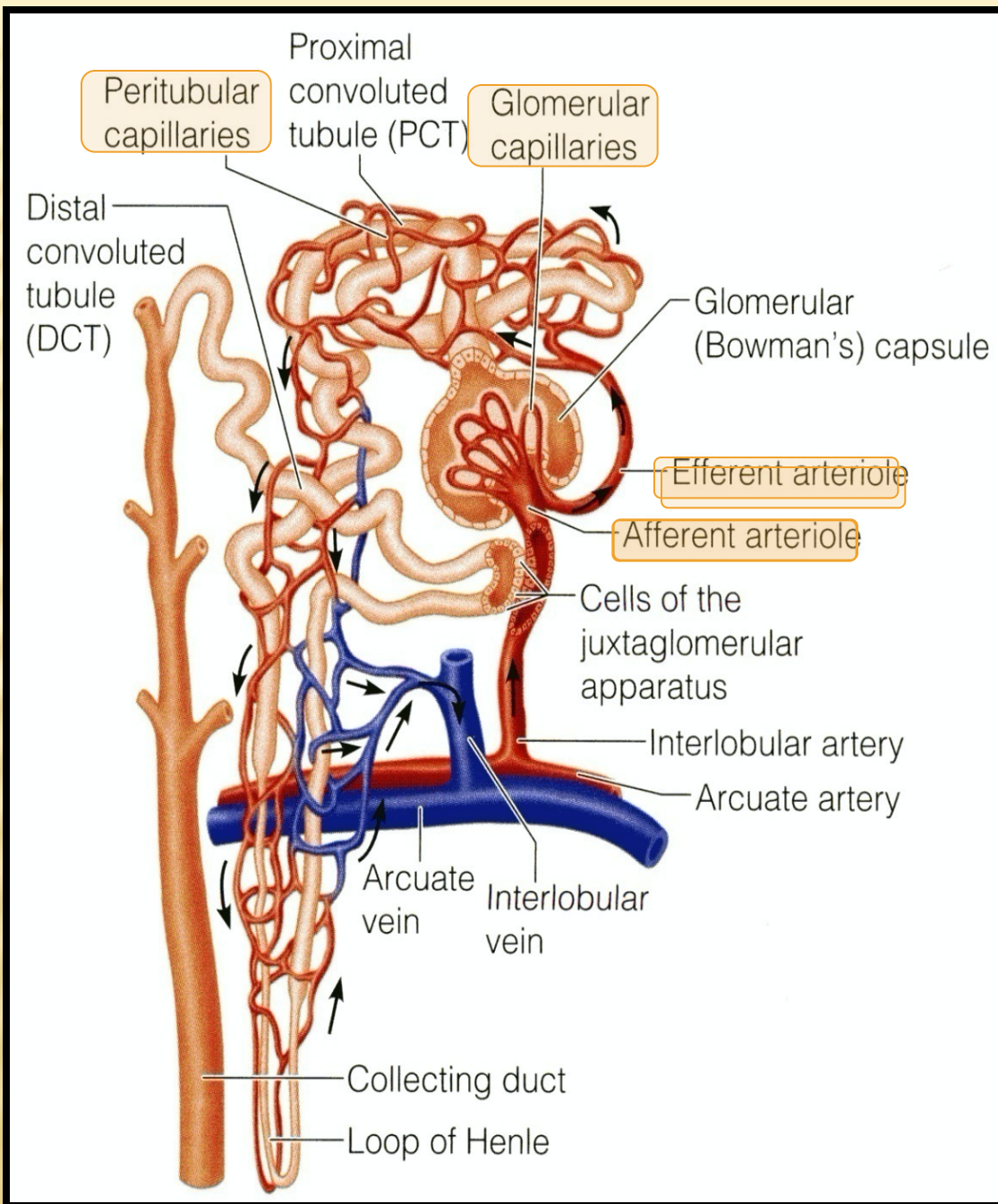
BLOOD SUPPLY

- ✘ Each lobar artery gives off 2 or 3 **interlobar arteries**.
- ✘ The **interlobar arteries** run toward the cortex on each side of the renal pyramid.
- ✘ **Interlobar arteries** give off the **arcuate arteries** at the junction of the cortex and medulla
- ✘ The arcuate arteries give off several **interlobular arteries**



✘ Interlobular artery gives off afferent glomerular arterioles .

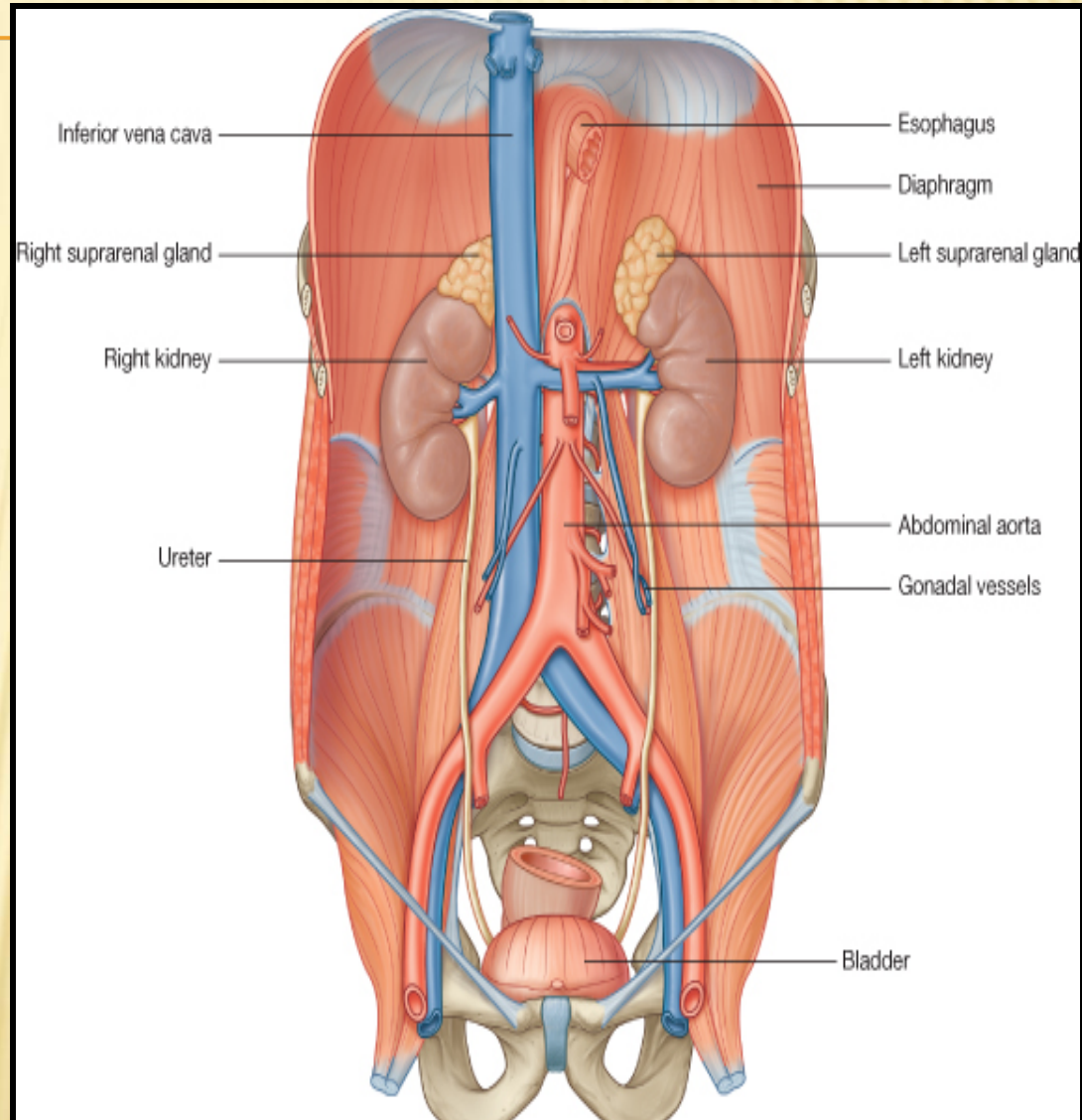




- ✘ Each **nephron** is associated with **two** capillary beds:
 1. The **glomerulus** and
 2. The **peritubular capillary bed**.
- ✘ The glomerulus is both fed and drained by **arterioles**.
 - + The **afferent arteriole**, which arises from an **interlobular artery**, is the "feeder vessel," and
 - + the **efferent arteriole** receives blood that has passed through the glomerulus.

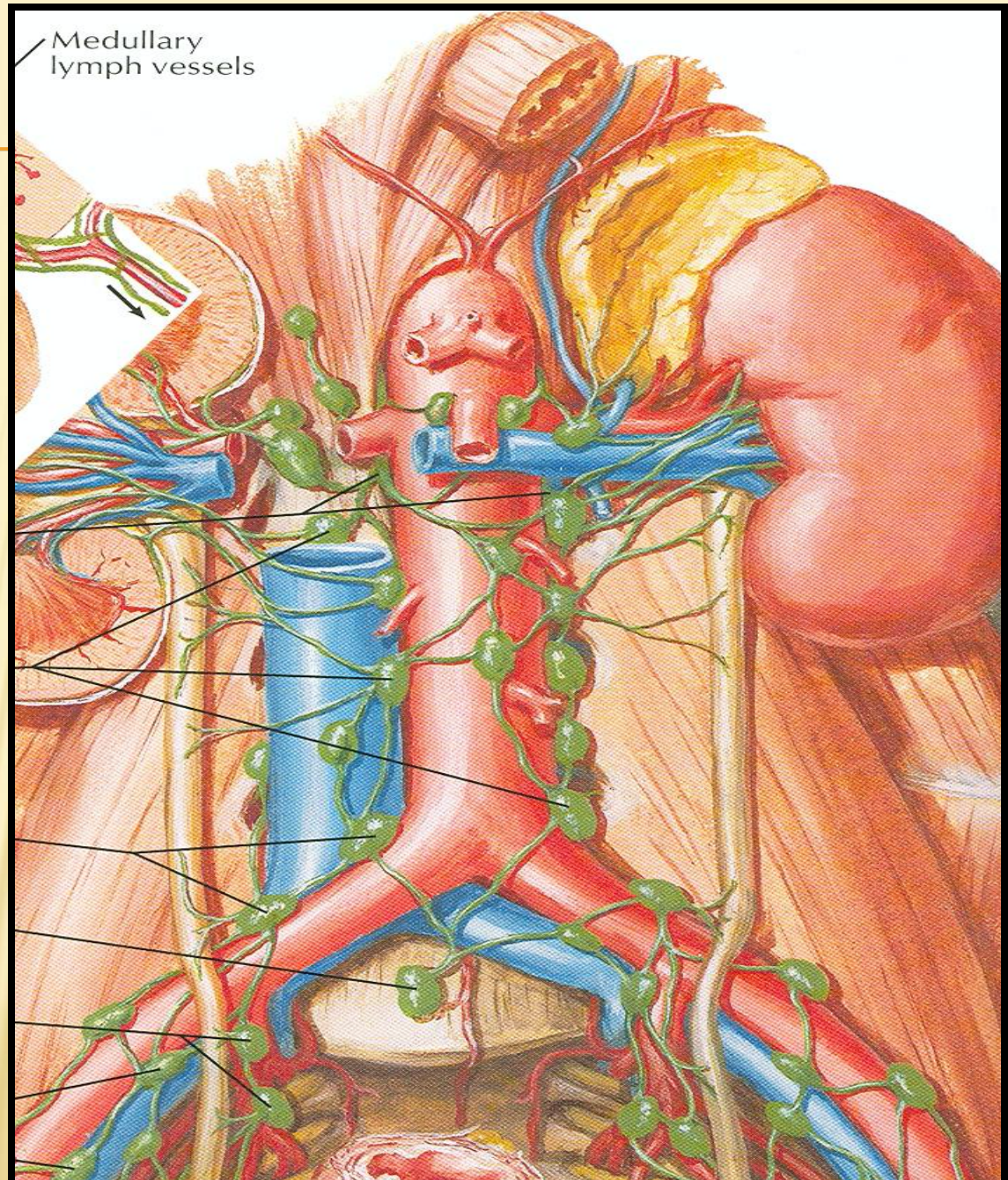
Venous Drainage

- ✘ Renal vein emerges from the hilum in front of the renal artery and drains into the IVC.
- ✘ The left renal vein is longer than the right renal vein.
- ✘ The left renal vein receives the left gonadal & the left suprarenal veins.



LYMPH

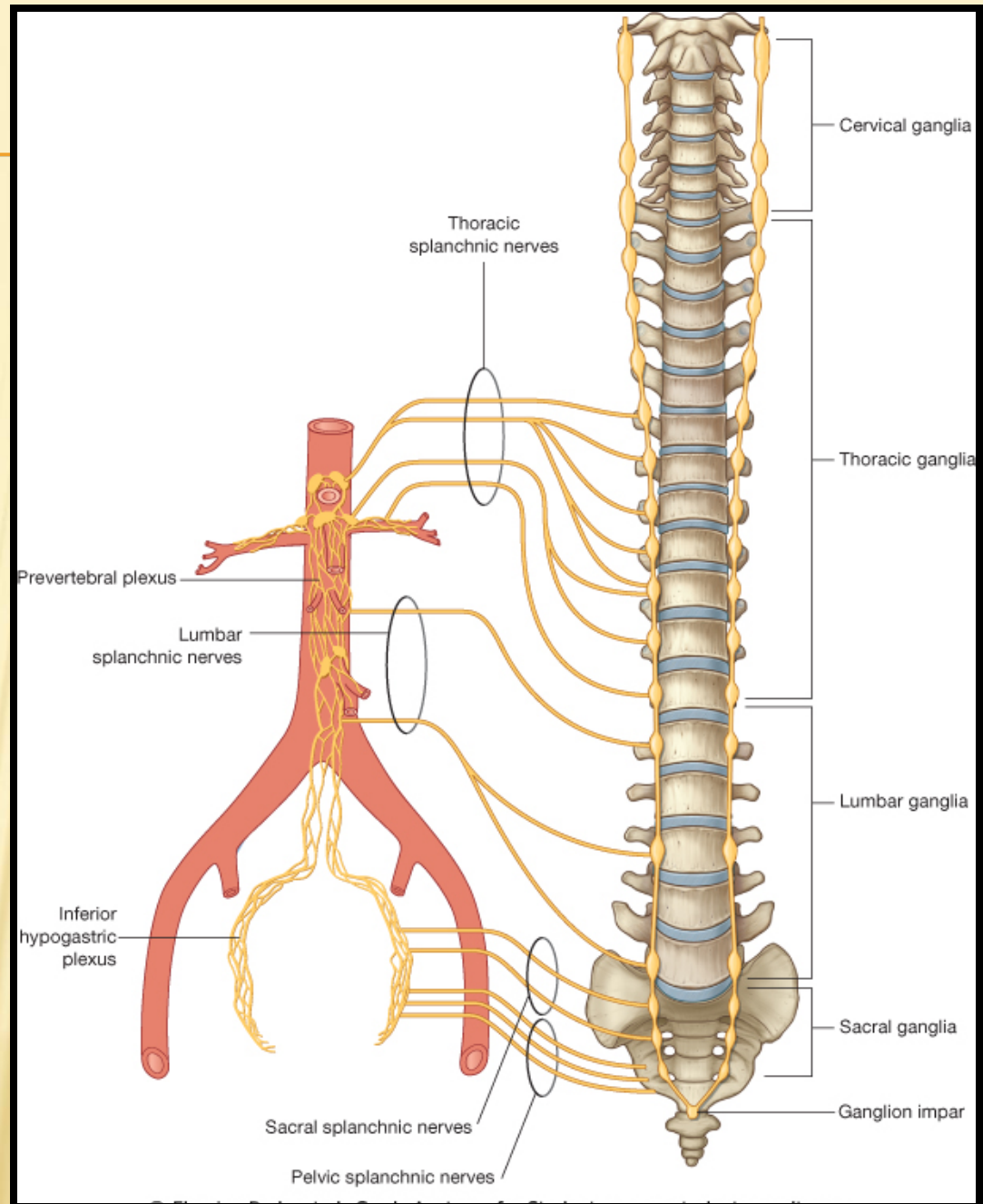
- ✘ **Lymph Drainage:**
- ✘ Lateral aortic lymph nodes around the origin of the renal artery.



NERVE SUPPLY

Nerve Supply

- ✘ Renal sympathetic plexus.
- ✘ The afferent fibers that travel through the renal plexus enter the spinal cord in the 10th, 11th, and 12th thoracic nerves.



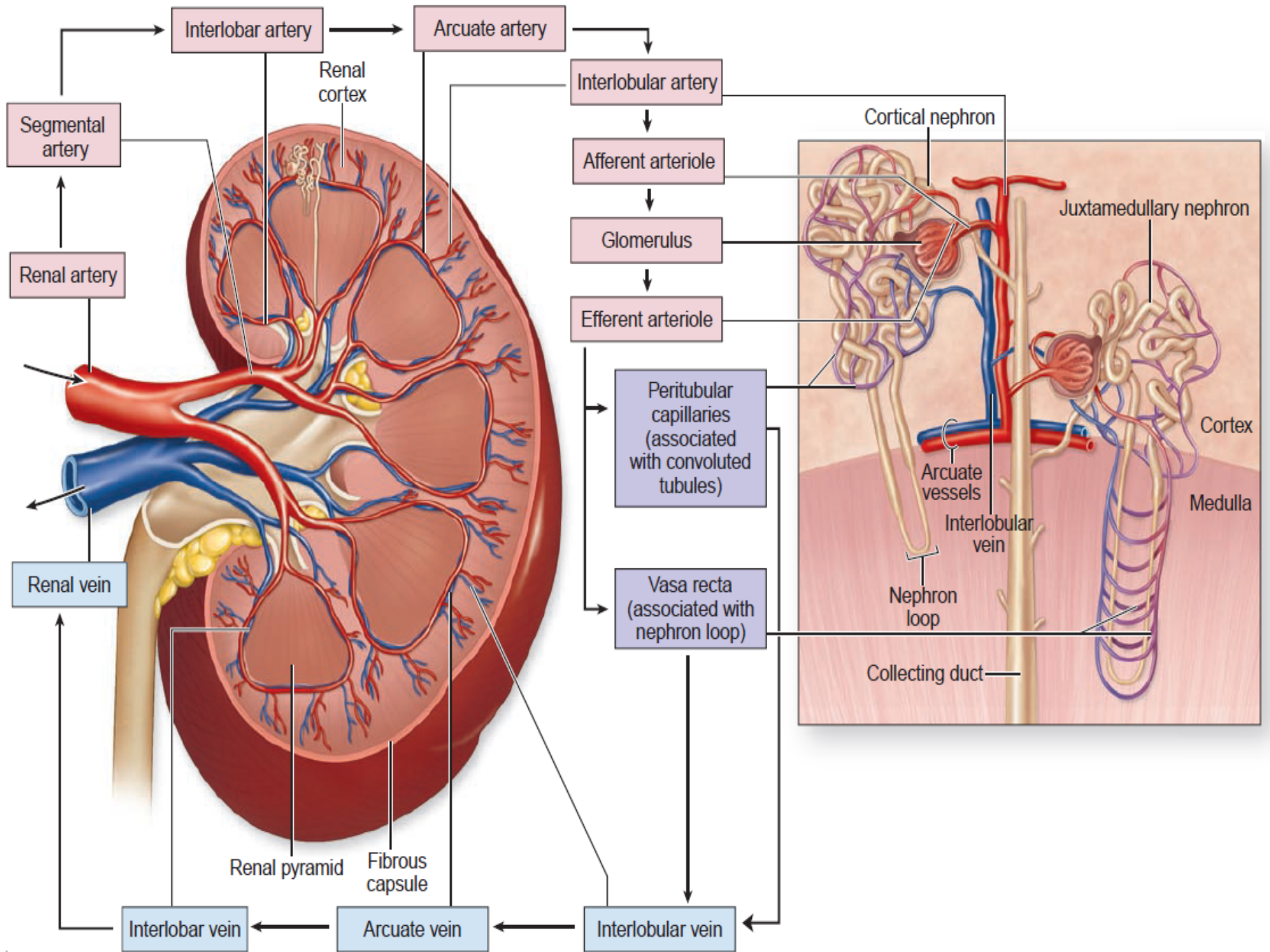


Figure 27.4